Name	Counterpart	Title
Bambang Irawan, Gindo Tampubolon, Hasbi Hasibuan	**B11**	Effects of Fertilizer Regimes and Time of Planting on Biodiversity Enrichment Experiment of Oil-Palm Landscape

Background and Methods

After four years of Biodiversity Enrichment Experiment (BEE) of CRC 990 /EFForTS Project, some initial conclusions can be made. The biodiversity enrichment in oil palm can generate synergies between economic and ecological functions under certain conditions. In the initial phase, EFForTS-BEE significantly increased yields per oil palm, which at the plot scale even compensated for the yield losses from oil-palm removal. In our analysis of net yield changes, we found an overall neutral effect on yields for small plots and a very variable, but overall significant positive effect for large plots (Gerard *et al*. 2017). Moreover, Teuscher *et al*. (2016) concluded that the initial positive responses of birds and invertebrates to the biodiversity enrichment treatments are promising and suggest that tree islands can be a suitable measure to enhance biodiversity in impoverished landscapes. Important knowledge on the best trees species that can be integrated to the monoculture oil-palm landscape was also revealed from this BEE project. Those tree species are *sungkai* (*Peronema canescens*), *petai* (*Parkia speciosa*) and *jengkol* (*Archidendron pauciflorum*) which showed the best growth performance both for tree diameter and height as well as survival rate.

The research was conducted in PT. Mekar Agro Sawit, located in Aur Gading, Jambi. The experimental design applied was Split Plot Randomized Design with the age of oil palm as main plots and fertilizer regime as sub plots. The age of oil palm was divided into 3 levels based on when the trees were planted. The first factor consisted of three levels namely: a1: one-year old oil palm; a3: three-year old oil palm and a5: five-year old oil palm. While the second factor consists of two levels namely f0: no additional fertilizer to trees and f1 additional fertilizer that was calculated based on soil nutrient content. The treatment combination was six with five replications, therefore the total number of plot treatments is 30 plots.

Four different tree species have been selected based on economical consideration (mainly due to the economic value of their products) and ecological consideration. Two fruit trees which were selected were *petai* (*Parkia speciosa*) and *jengkol* (*Archidendron pauciflorum*), while the wood trees which were selected to be planted were *bulian* (*Eusideroxlyon zwageri*), and *sungkai* (*Peronema canescens*). The trees were planted on December 12, 2017 with the total number being 600 trees, consisting of 150 trees per species. The trees were planted in the middle of four oil palm trees.

Figure 1. Sungkai (*Peronema canescens*).

Figure 2. Petai (*Parkia speciosa*).

Figure 3. Jengkol (*Archidendron pauciflorun*).

Objectives

The overall objective of this research is to study whether or not the BEE is still feasible both in ecological and economical views when the number of oil palm trees and the planting space stays the same as in the regular plantation. While the specific objectives are: (1) to study the interaction between the age of oil palm when the enrichment trees are planted and fertilizer regimes; (2) to study the impact of oil palm age when the enrichment trees are planted to the growth and survival rate of the trees and production of palm oil and; (3) to study the impact of fertilizer to the growth of trees and the production of palm oil.

Figure 4. Bulian (*Eusideroxlyon zwageri*).

Results

A. Tree Growth

Treatment of oil palm based on age significantly influenced the diameter and height of *petai* (*Parkia speciosa*) as well as the diameter of *sungkai* (*Peronema canescens*), while fertilizer regimes as well as the interaction between age of oil palm and fertilizer were not significantly different to any other species and parameters. Only the diameter of *petai* and *sungkai* as well as the height of *petai* were significantly different among oil palm age. While the other parameters of the other species were not significantly different. The highest value of diameter of *petai* and *sungkai* belonged to trees that were planted among one-year old oil palm trees. The same results were also revealed by the height of *petai*. The *petai* that were planted among one-year old oil palm trees significantly grew faster than *petai* that were planted among three and five-year old oil palm trees. Almost similar results were also shown by *sungkai*, where the *sungkai* that were planted among one-year old oil palm trees have grown significantly faster than the *sungkai* planted among five-year old oil palm trees, especially in its diameter. But they were not significantly different to *sungkai* that planted among three-year old oil palm trees.

The effects of fertilizer to the growth of trees that were planted among oil palm are closely similar. There was a clear indication that giving additional fertilizer will increase the growth rate of trees both in diameter and height. But only the diameter of *petai* have revealed significantly different results based on a 5% significant level of Duncan Multiple Range Test.

B. Production of Oil Palm

The t test on production of palm oil in the plot with tree enrichments compared to control plots (plot with no trees) shows that there is no significant difference in both the three and five-year old oil palm except for production of palm oil where their plot has been enriched by *petai* at five-year old. The plot with and without fertilizer also gave the same results. However, there was a small indication that the plot with additional fertilizer tended to produce a little bit higher compared to unfertilized plots both at three and five-year old oil palm except for plots that were enriched by *jengkol* trees.